

Friday Night Fun with Flags: GeoGebra for Geometry & Graphing



Presented By:

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PD/Curriculum Specialist

Illinois Math & Science Academy (IMSA)

Center for Teaching and Learning

Who is IMSA? The **Illinois Mathematics and Science Academy**, or **IMSA**, is a three-year residential public secondary education institution in Aurora, Illinois, with an enrollment of approximately 650 students. Enrollment is generally offered to incoming sophomores, although younger students who have had the equivalent of one year of Algebra and a 9th grade science equivalent are eligible to apply. All applicants undergo a competitive admissions process. Due to its nature as a public institution, there are no charges related to tuition, room and board; however, there is an annual student fee which may be reduced or waived based on family income. IMSA has been consistently ranked by Newsweek as one of the top ten high schools in the country for math and science, and some of its graduates have moved on to become leaders in a variety of fields. It is the top-rated public high school in Illinois on Niche.com.

Mission: To ignite and nurture creative, ethical, scientific minds that advance the human condition.

Who is the IMSA Center for Teaching and Learning? IMSA offers professional development sessions on mathematics, science, technology, and pedagogy for pre-service and in-service educators and administrators. These professional development opportunities align with IMSA's signature strategy of learning: Inquiry-Based, Problem-Centered, Competency-Driven and Integrative. Professional learning opportunities include events held at IMSA, sessions presented at conferences, and workshops delivered in schools across the state and beyond. Educator workshops can be customized to meet any school's specific needs.

Learning objectives:

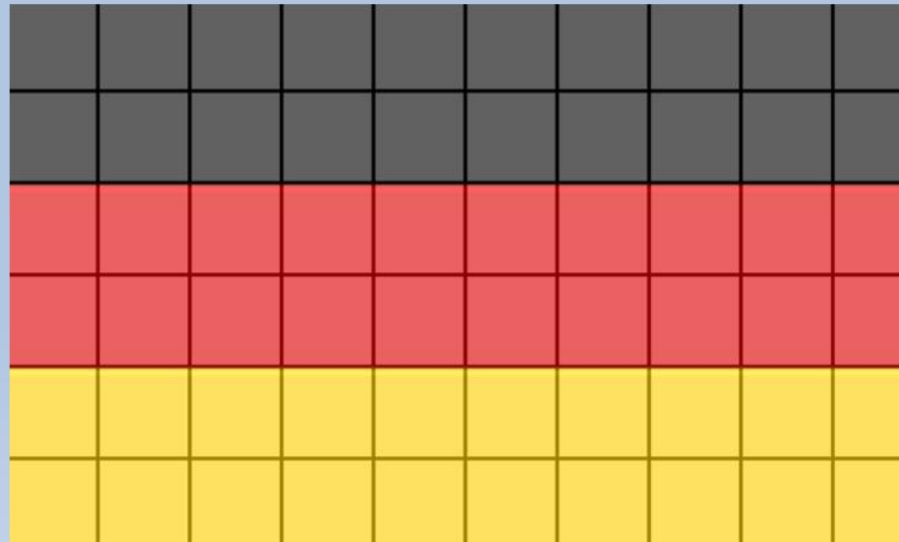
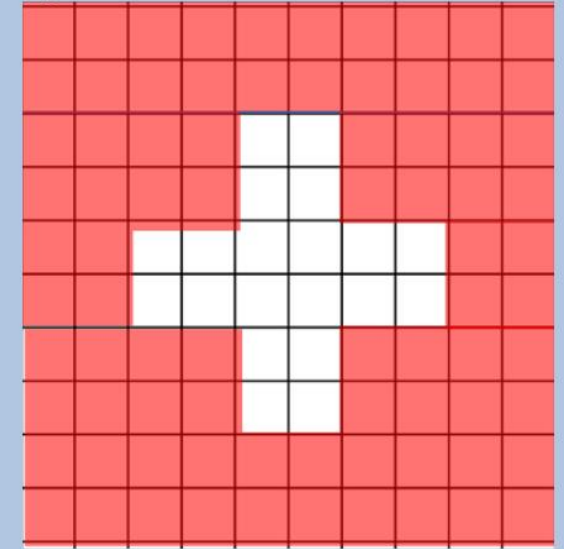
- **Discover how GeoGebra can be used in Geometry, specifically with area, through the use of the flags**
- **Experience how GeoGebra can be used in graphing specifically with linear equations, through the use of flags**

Fun with Flags:

GeoGebra for Geometry & Graphing

- Flag Examples
- Overview of GeoGebra
- How to Insert Images into GeoGebra
- How to Find Area of an Object in GeoGebra
 - How to Graph in GeoGebra
 - Explore GeoGebra

What Countries are Represented ?



Flag Source: <https://www.britannica.com/>

What country has
this flag?



- Since images can be of different sizes let's all use the same flag for this example found at www.britannica.com/topic/flag-of-the-Republic-of-the-Congo
- Right click & save to your desktop

Go to

www.britannica.com/topic/flag-of-the-Republic-of-the-Congo

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Flag of the Republic of the Congo

WRITTEN BY: [Whitney Smith](#)
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Alternative Title: flag of Congo-Brazzaville



national flag consisting of a diagonal yellow stripe separating a green triangle at the hoist from a red triangle at the fly end. It has a width-to-length ratio of 2 to 3.

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www.britannica.com/topic/flag-of-the-Republic-of-the-Congo

Right click & “Save image as...”

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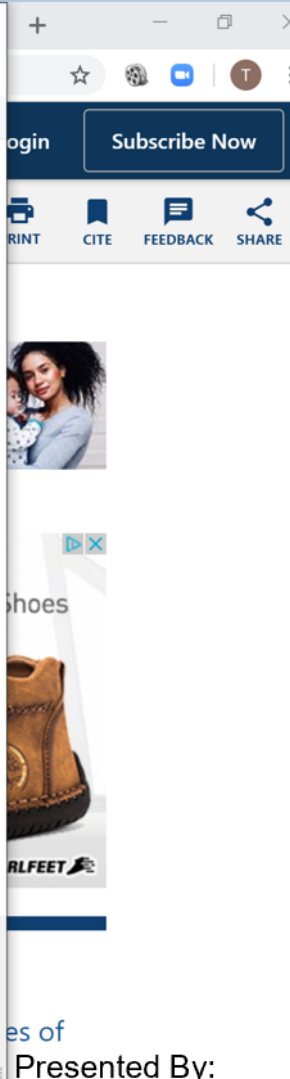
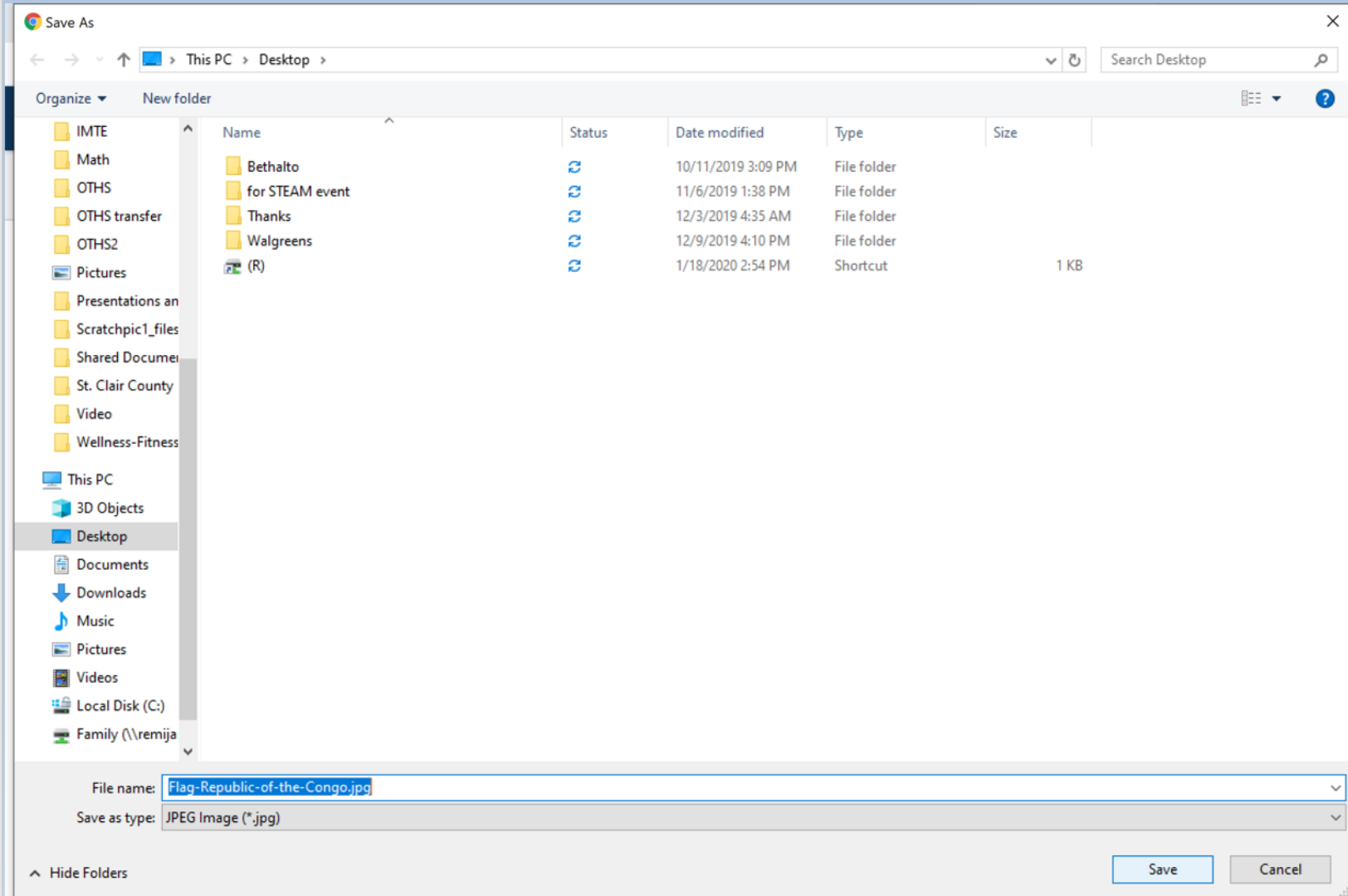
grammarly

Instant Grammar Checker

Correct all grammar errors and enhance your writing.

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Recommendation: Save the flag to your desktop



Go to GeoGebra.org

A dynamic mathematics software for all levels of education that brings together geometry, algebra, spreadsheets, graphing...

The screenshot shows the GeoGebra.org website. At the top, the browser address bar displays 'geogebra.org/?lang=en'. The website header includes the GeoGebra logo, a search bar labeled 'Search Classroom Resources', and a 'SIGN IN' button. A left sidebar contains navigation links: Home, News Feed, Resources, Profile, People, Groups, and App Downloads. The main content area features a 'GeoGebra Math Apps' section with the text 'Get our free online math tools for graphing, geometry, 3D, and more!' and two buttons: 'START GRAPHING' and 'CLASSROOM RESOURCES'. Below this, there are three columns of links: 'New Math Apps' (Graphing Calculator, 3D Calculator, CAS Calculator, Scientific Calculator), 'More Apps' (Notes, Geometry, GeoGebra Classic, Probability), and 'Offline Apps' (App Store, Google Play, Microsoft Store, App Downloads). An image of a laptop, tablet, and smartphone displaying various math tools is positioned to the right of the 'GeoGebra Math Apps' section. The footer contains contact information, a language selector set to 'English', social media icons, and a copyright notice for 2020.

geogebra.org/?lang=en

GeoGebra Search Classroom Resources

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Home

News Feed

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App Downloads

About GeoGebra
Contact us: office@geogebra.org
Terms of Service – Privacy – License
Language: English

© 2020 GeoGebra
<https://www.geogebra.org/graphing>

GeoGebra Math Apps

Get our free online math tools for graphing, geometry, 3D, and more!

START GRAPHING

CLASSROOM RESOURCES

New Math Apps

- Graphing Calculator
- 3D Calculator
- CAS Calculator
- Scientific Calculator

More Apps

- Notes
- Geometry
- GeoGebra Classic
- Probability

Offline Apps

- App Store
- Google Play
- Microsoft Store
- App Downloads

Go to www.GeoGebra.org Click Geometry

← → ↻ geogebra.org ☆ 🌐 📱 🔒

GeoGebra 🔍 Search Classroom Resources

🏠 Home

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👤 Profile

👥 People

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📱 App Downloads

GeoGebra Math Apps

Get our free online math tools for graphing, geometry, 3D, and more!

[START GRAPHING](#) [CLASSROOM RESOURCES](#)

New Math Apps

- Graphing Calculator
- 3D Calculator
- CAS Calculator
- Scientific Calculator

More Apps

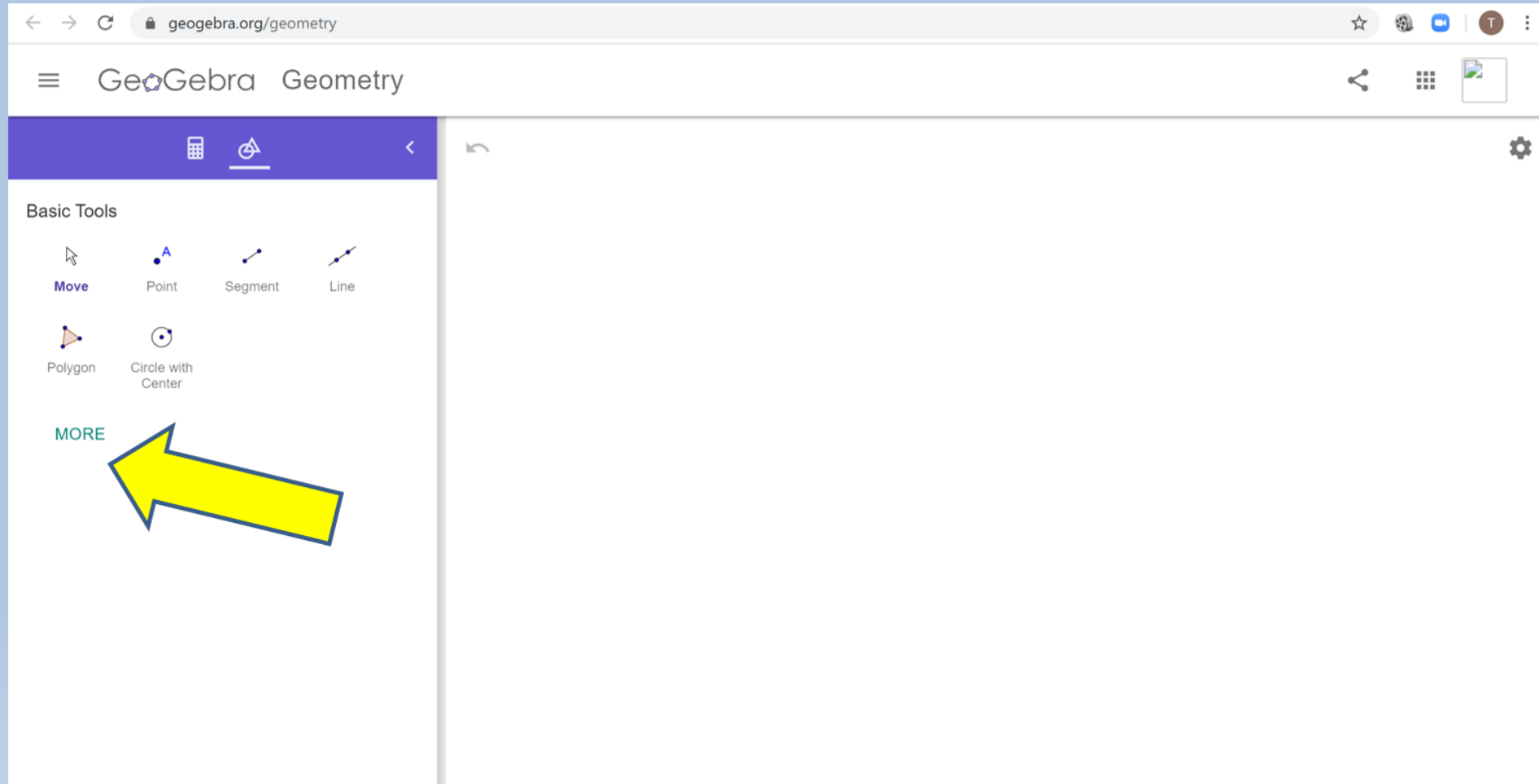
- Notes
- [Geometry](#)
- GeoGebra Classroom
- Probability

Offline Apps

- App Store
- Google Play
- Microsoft Store
- App Downloads

About GeoGebra
Contact us: office@geogebra.org

Under Geometry Basic Tools Click “More”



Scroll down to Media Click “Image”

The screenshot shows the GeoGebra Geometry web application interface. The browser address bar displays geogebra.org/geometry. The page title is "GeoGebra Geometry". A purple toolbar is visible at the top of the workspace. On the left side, there is a sidebar menu with several categories: "Circles", "Polygons", "Transform", and "Media". The "Media" category is expanded, showing two options: "Image" (represented by a picture icon) and "Text" (represented by a text icon). A large yellow arrow with a blue outline points from the top right towards the "Image" button in the Media section. The main workspace area is currently empty.

Click Choose File

← → ↻ geogebra.org/geometry ☆ 🌐 📺 | T ⋮

≡ GeoGebra Geometry 🔗 📱 🖨

📊 🔍 <

Circles

Circle with Center Circle: Center & Radius Compass Semicircle

Circular Sector

Polygons

Polygon Regular Polygon

Transform

Translate by Vector Rotate around Point Reflect about Line Reflect about Point

Dilate from Point

Media

Image ABC Text

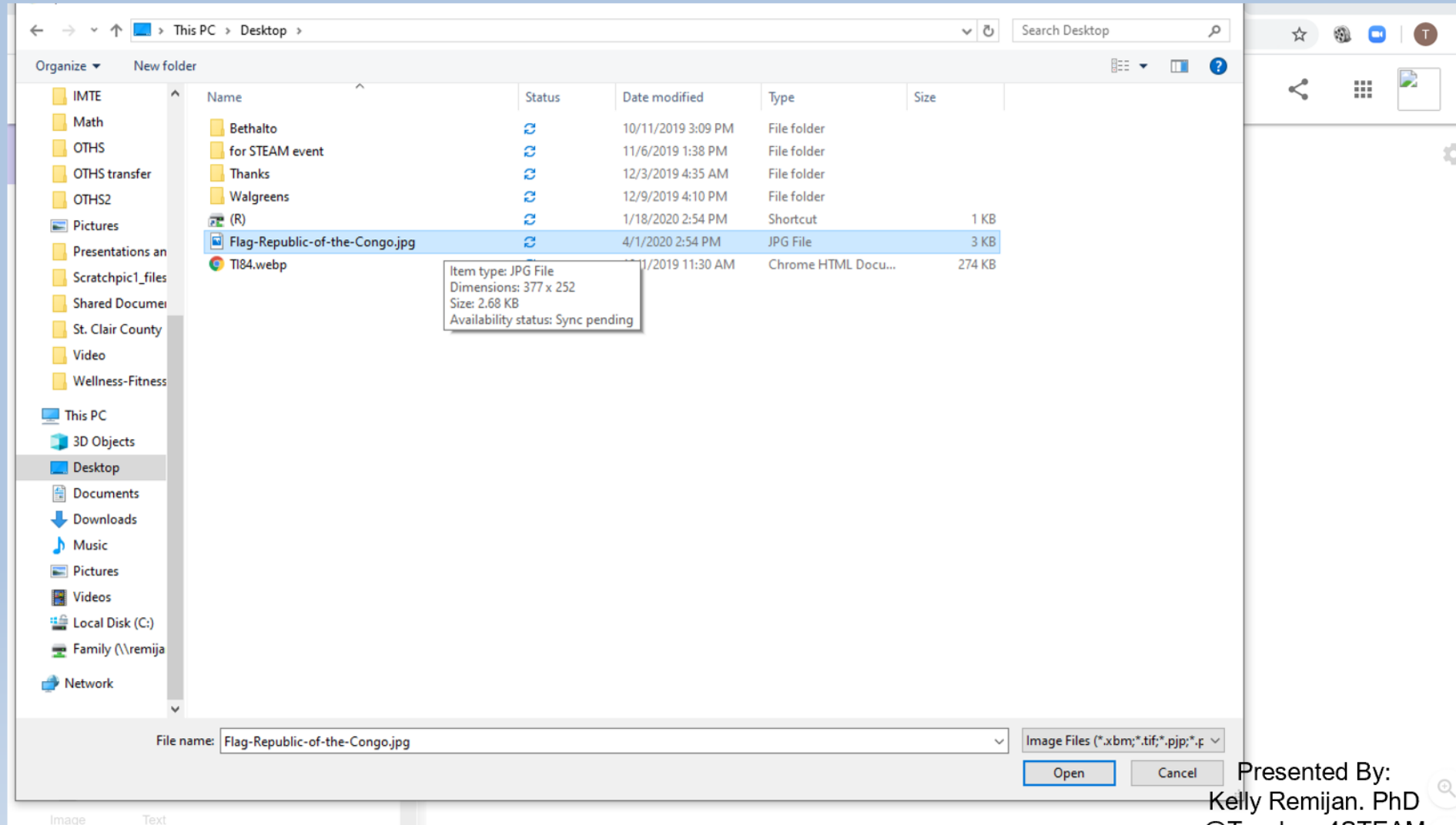
Image

File Choose File No file chosen

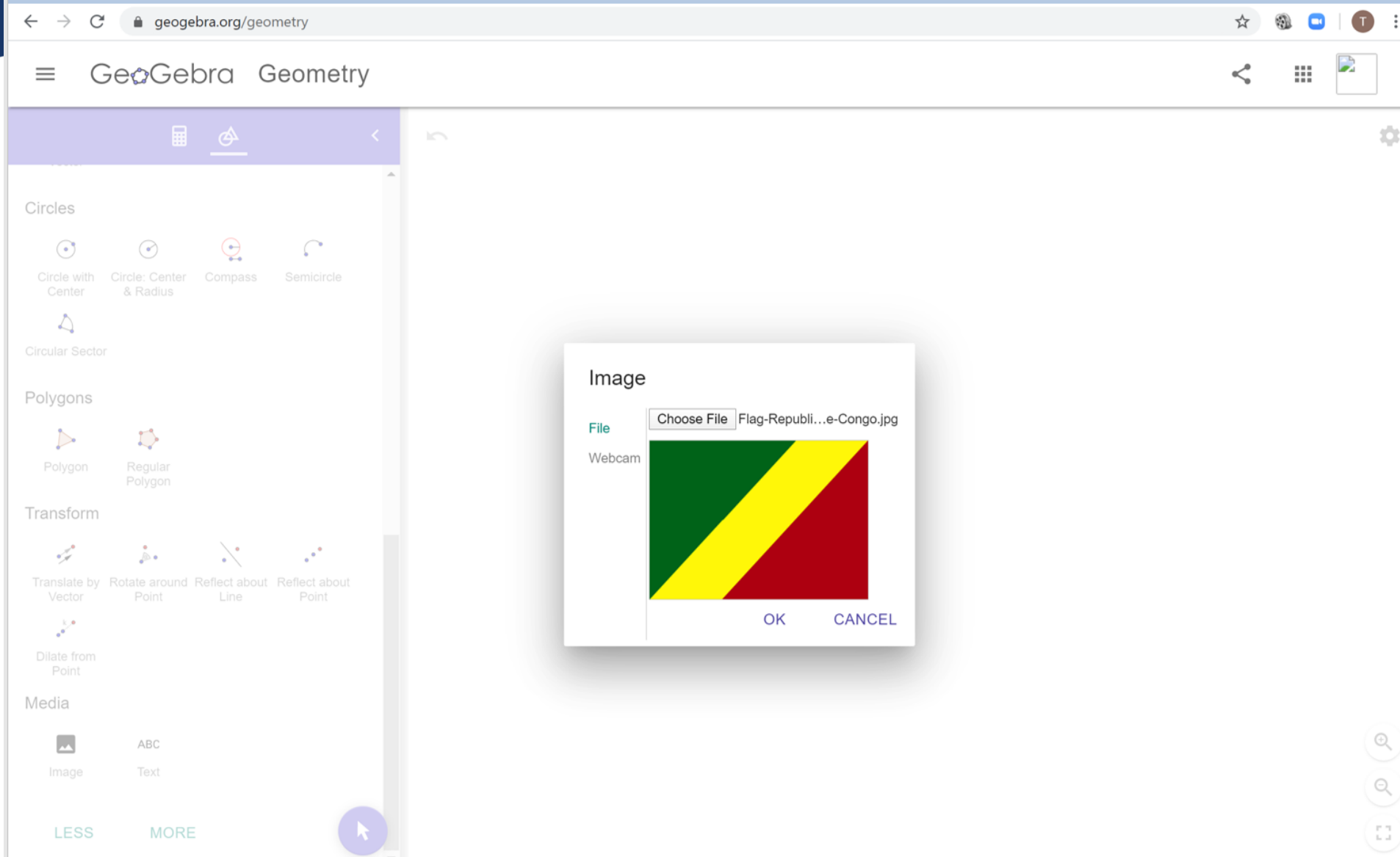
Webcam

OK CANCEL

Select the flag that was saved to your desktop.



Click OK




Flag Has Been Inserted into GeoGebra





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Calculator  < ↶

Circles





 Circle with Center  Circle: Center & Radius  Compass  Semicircle


 Circular Sector

Polygons



 Polygon  Regular Polygon

Transform


 Translate by Vector  Rotate around Point  Reflect about Line  Reflect about Point

 Dilate from Point

Media

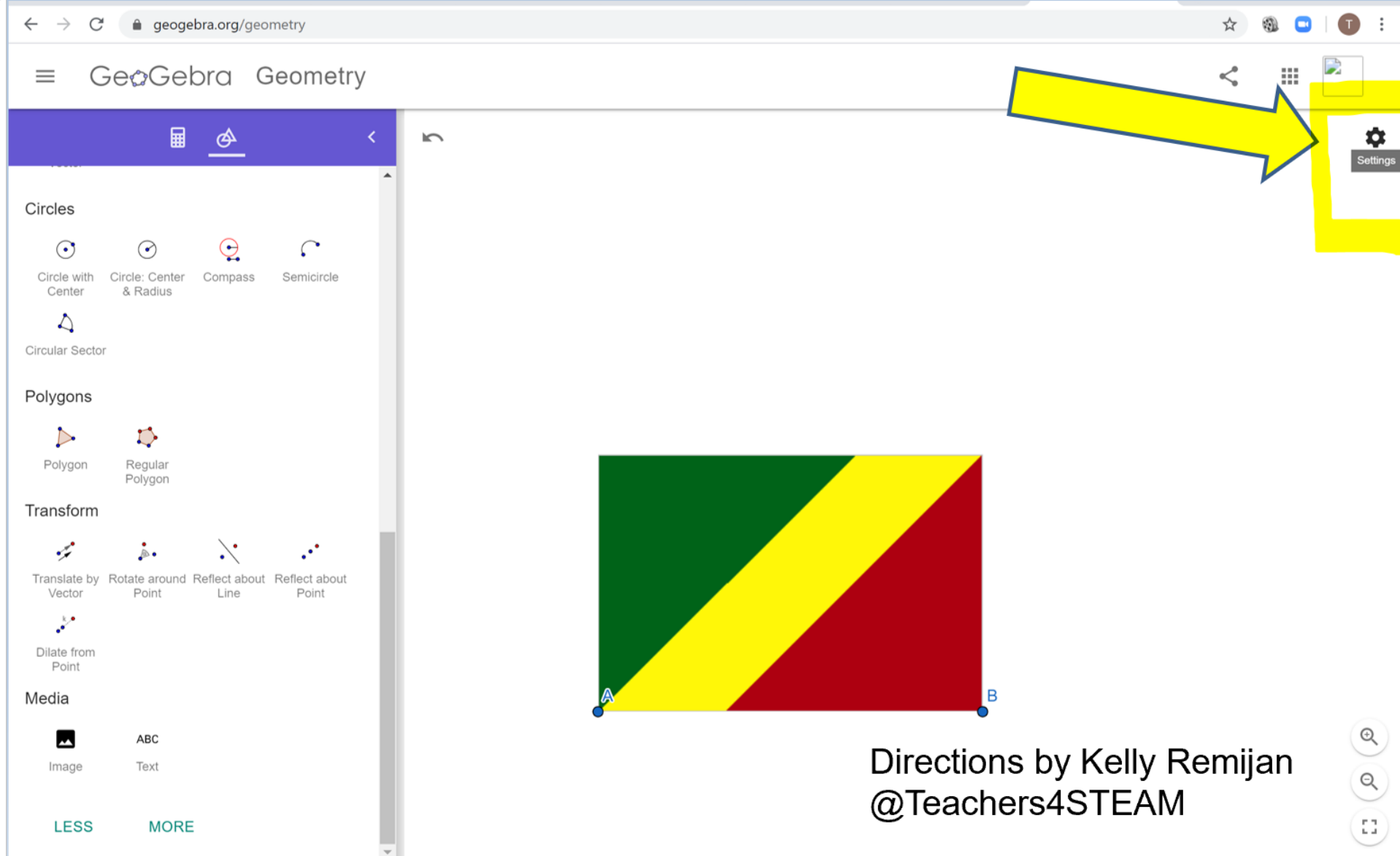
 Image ABC  Text

LESS MORE



Directions by Kelly Remijan
@Teachers4STEAM

Click “Settings”



The screenshot shows the GeoGebra Geometry web application. The left sidebar contains a menu with categories: Circles, Polygons, Transform, and Media. The main workspace displays a rectangle divided into three colored regions: green (top-left triangle), yellow (diagonal strip), and red (bottom-right triangle). The vertices of the rectangle are labeled A and B. A large yellow arrow points from the top right towards the 'Settings' icon (a gear) in the top right corner of the application window.

geogebra.org/geometry

GeoGebra Geometry

Circles

- Circle with Center
- Circle: Center & Radius
- Compass
- Semicircle

Circular Sector

Polygons

- Polygon
- Regular Polygon

Transform

- Translate by Vector
- Rotate around Point
- Reflect about Line
- Reflect about Point

Dilate from Point

Media

- Image
- Text

LESS MORE

Settings

Directions by Kelly Remijan
@Teachers4STEAM

Click “Show Axes”

The screenshot shows the GeoGebra Geometry interface. On the left is a toolbar with categories: Circles (Circle with Center, Circle: Center & Radius, Compass, Semicircle, Circular Sector), Polygons (Polygon, Regular Polygon), Transform (Translate by Vector, Rotate around Point, Reflect about Line, Reflect about Point, Dilate from Point), and Media (Image, Text). The main workspace contains a square divided into three triangles by a diagonal line from the bottom-left corner (labeled A) to the top-right corner. The top-left triangle is green, the bottom-right triangle is red, and the central triangle is yellow. A yellow arrow points from the top-right towards the settings menu. The settings menu is open, showing options: Show Axes (selected), Show Grid, Snap to Grid, Clear all Traces, Zoom to fit, and Settings. The browser address bar shows 'geogebra.org/geometry'.

Directions by Kelly Remijan
@Teachers4STEAM

Click “Show Grid”, then click “Major Gridlines”

The screenshot displays the GeoGebra Geometry workspace. On the left, a toolbar lists various geometric tools under categories: Circles, Polygons, Transform, and Media. The main workspace features a coordinate plane with a grid. A yellow rectangle is drawn, divided into three colored regions: green (top-left), yellow (top-right), and red (bottom-right). Two points, A and B, are marked on the bottom edge of the rectangle. A right-click context menu is open over the grid, showing options: Show Axes, Show Grid, No Grid, Major Gridlines (highlighted), Major and Minor Gridlines, Polar, Isometric, Snap to Grid, Clear all Traces, Zoom to fit, and Settings. A yellow arrow points from the top text to the 'Show Grid' option, and another yellow arrow points from the 'Show Grid' option to the 'Major Gridlines' option.

GeoGebra Geometry

Tools: Calculator, Geometry

Circles

- Circle with Center
- Circle: Center & Radius
- Compass
- Semicircle

Circular Sector

Polygons

- Polygon
- Regular Polygon

Transform

- Translate by Vector
- Rotate around Point
- Reflect about Line
- Reflect about Point
- Dilate from Point

Media

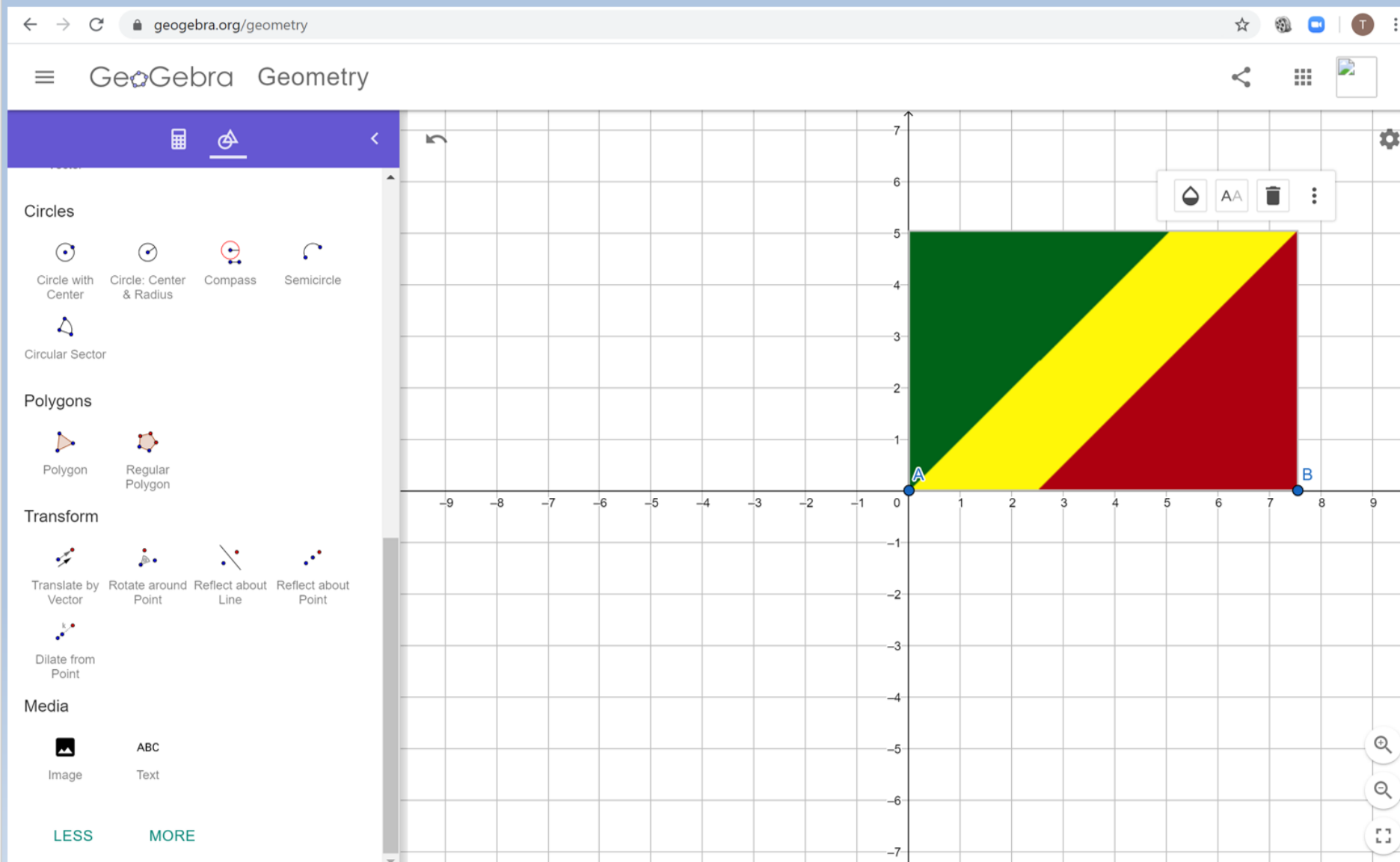
- Image
- Text

Grid Options:

- Show Axes
- Show Grid
- No Grid
- Major Gridlines
- Major and Minor Gridlines
- Polar
- Isometric
- Snap to Grid
- Clear all Traces
- Zoom to fit
- Settings

Directions by Kelly Remijan
@Teachers4STEAM

Click the flag and drag as shown



Left click on the flag,
then click the “teardrop”
to make the image transparent

geogebra.org/geometry

GeoGebra Geometry

Circles

- Circle with Center
- Circle: Center & Radius
- Compass
- Semicircle

Polygons

- Polygon
- Regular Polygon

Transform

- Translate by Vector
- Rotate around Point
- Reflect about Line
- Reflect about Point
- Dilate from Point

Media

- Image
- Text

7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5

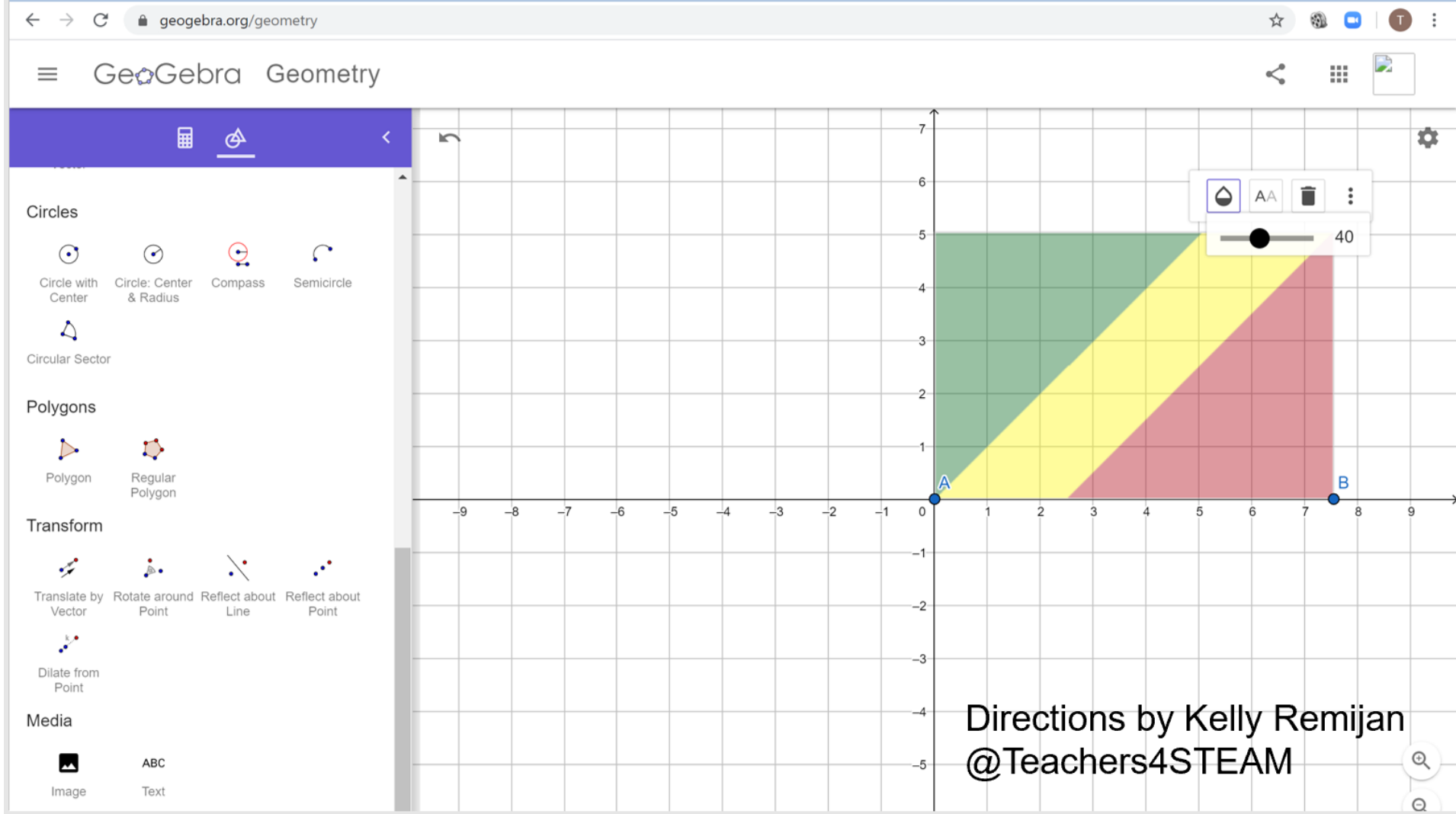
-9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9

A B

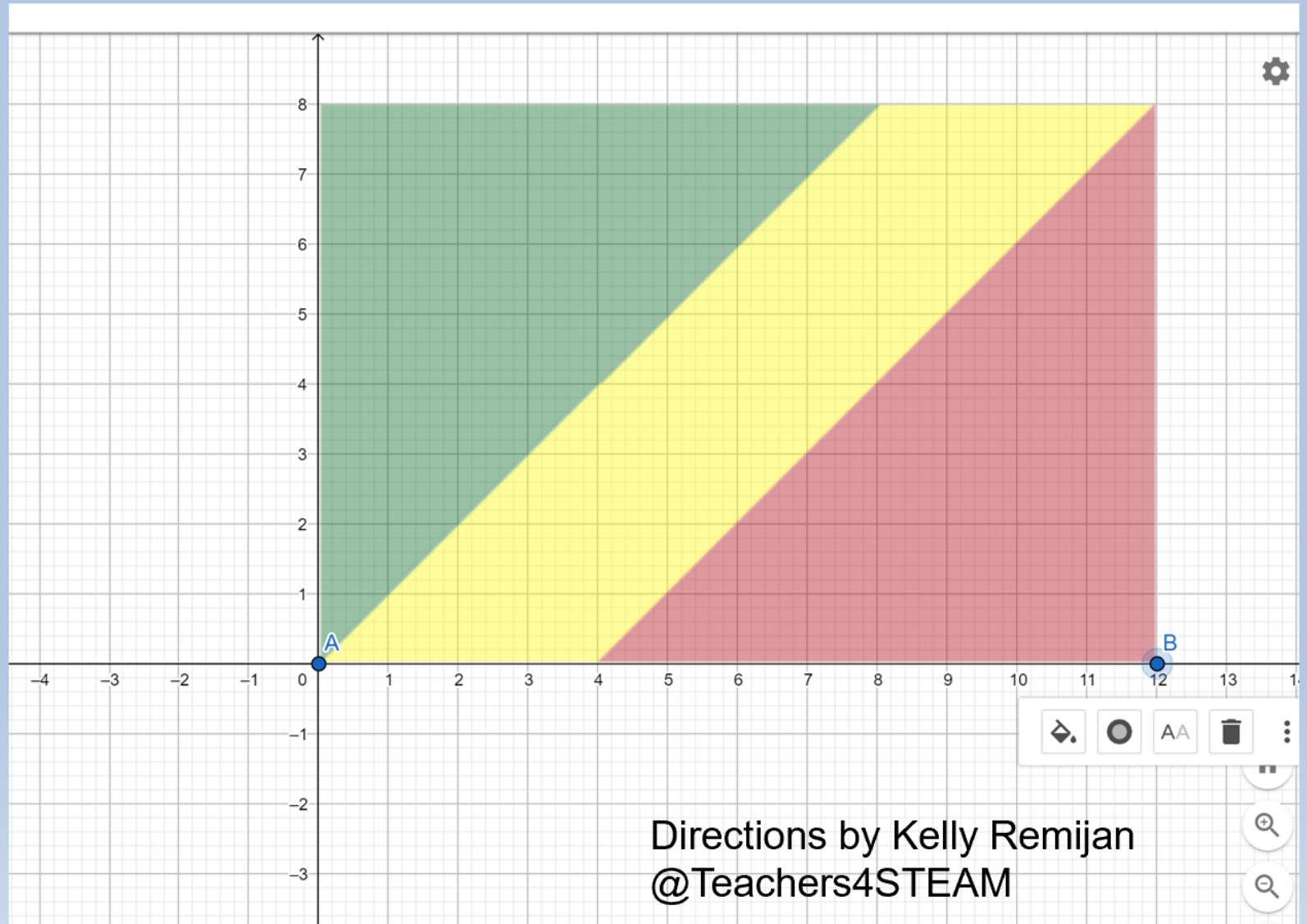
40

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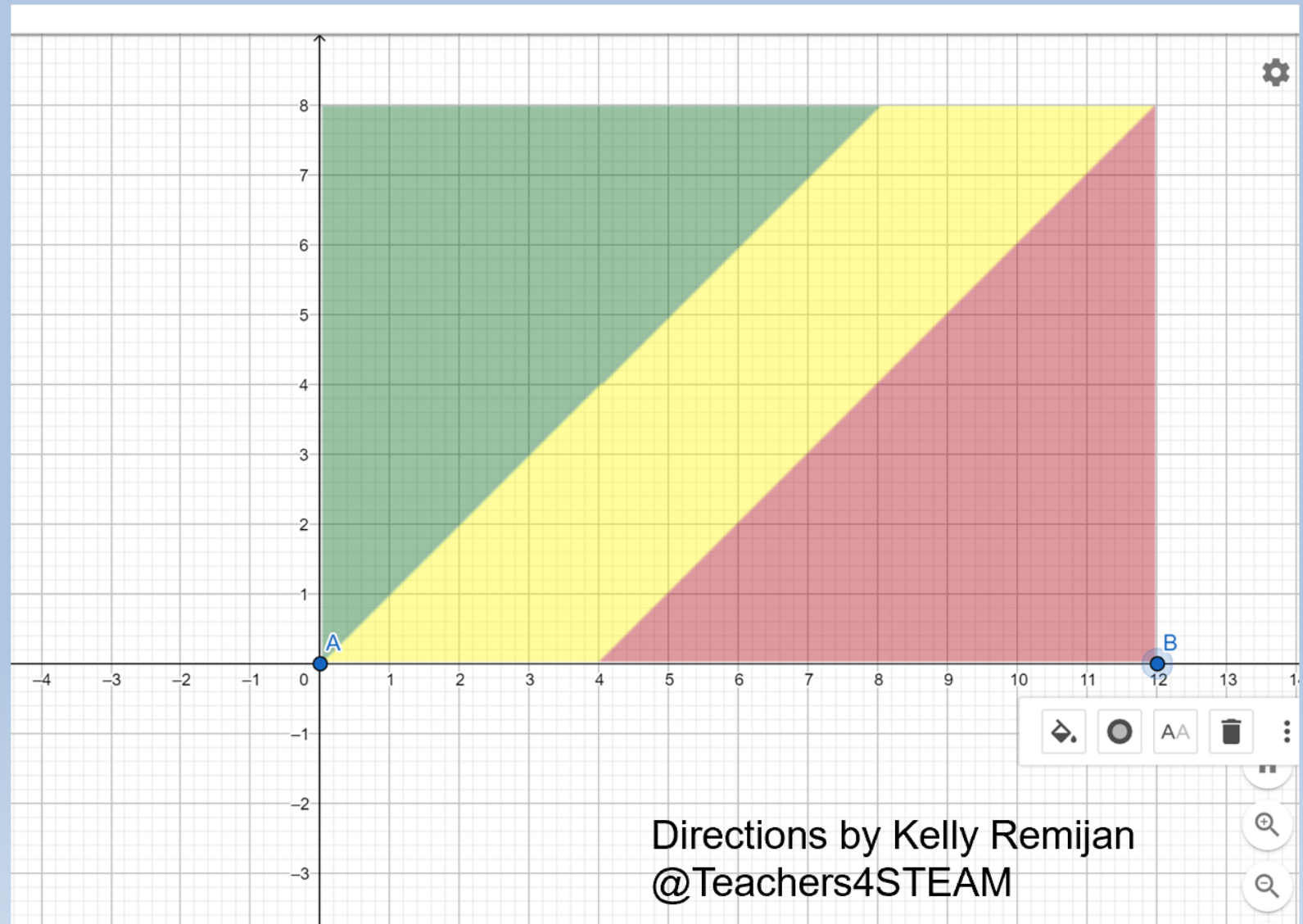
Left click on the blank graph and move the graph to see only Quadrant 1



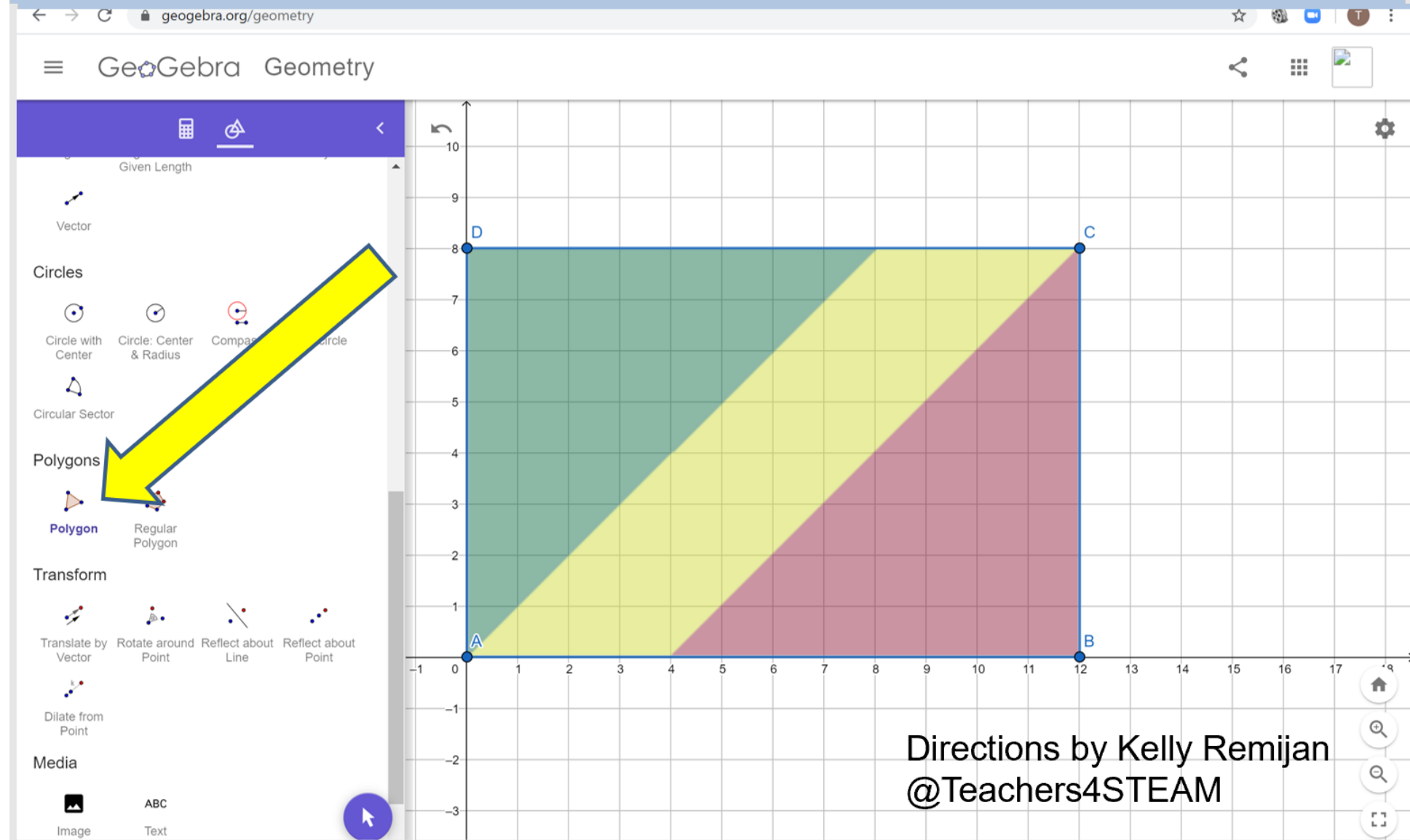
What is the Area of the Flag?



Calculate the area of the flag by hand. Then, confirm using GeoGebra.



Click “Polygon”, then click the vertices surrounding the rectangle (A,B,C,D & A again)

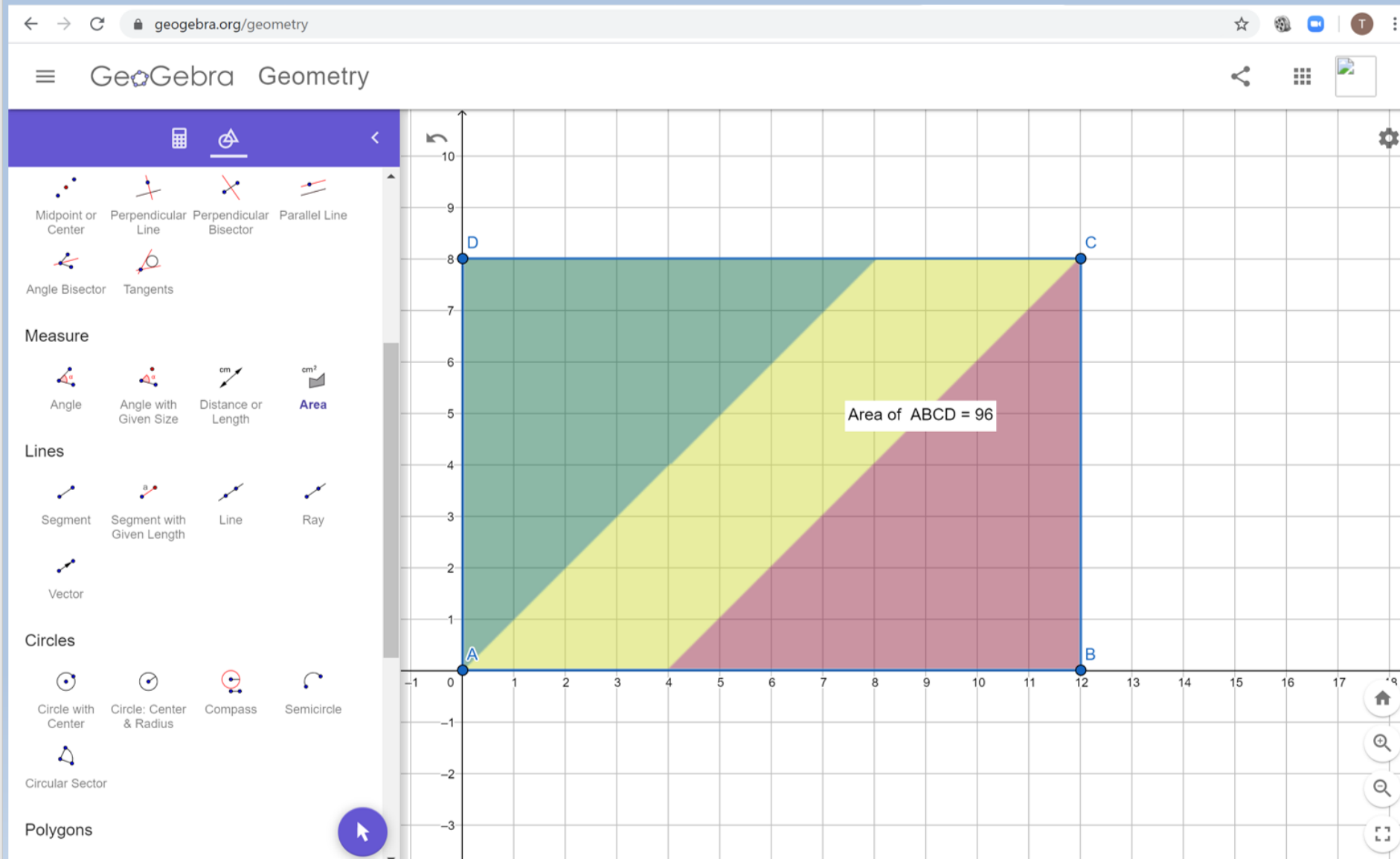


Under Measure, Click “Area”, then Click the rectangle.

The screenshot shows the GeoGebra Geometry workspace. On the left, the 'Measure' menu is open, and a yellow arrow points to the 'Area' tool. The workspace contains a rectangle ABCD with vertices A(0,0), B(12,0), C(12,8), and D(0,8). A diagonal line segment connects A and C. The rectangle is divided into three regions: a green triangle ABC, a yellow triangle ADC, and a pink triangle BDC. The x-axis ranges from -1 to 17, and the y-axis ranges from -3 to 10.

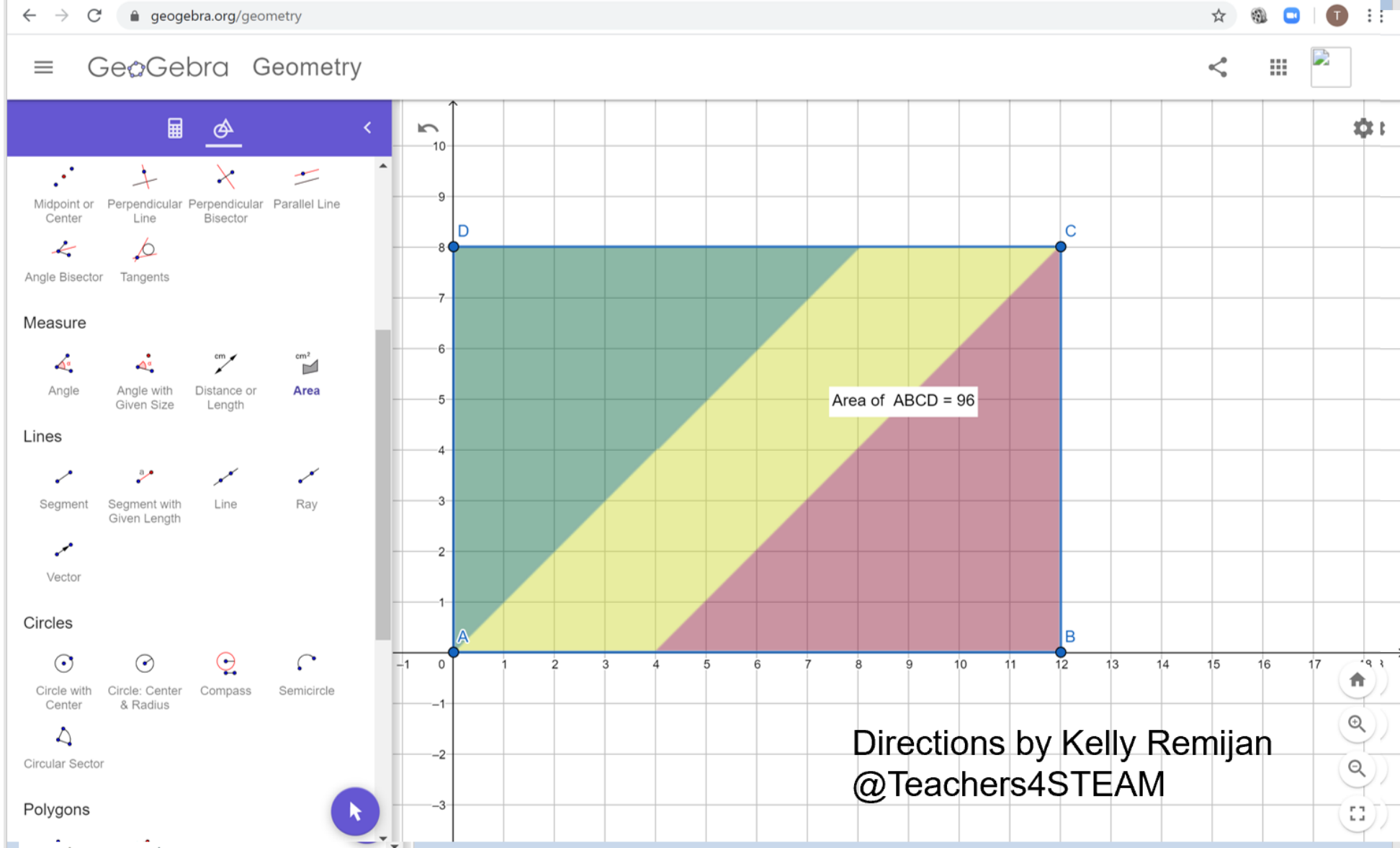
Directions by Kelly Remijan
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Was our area calculation correct?

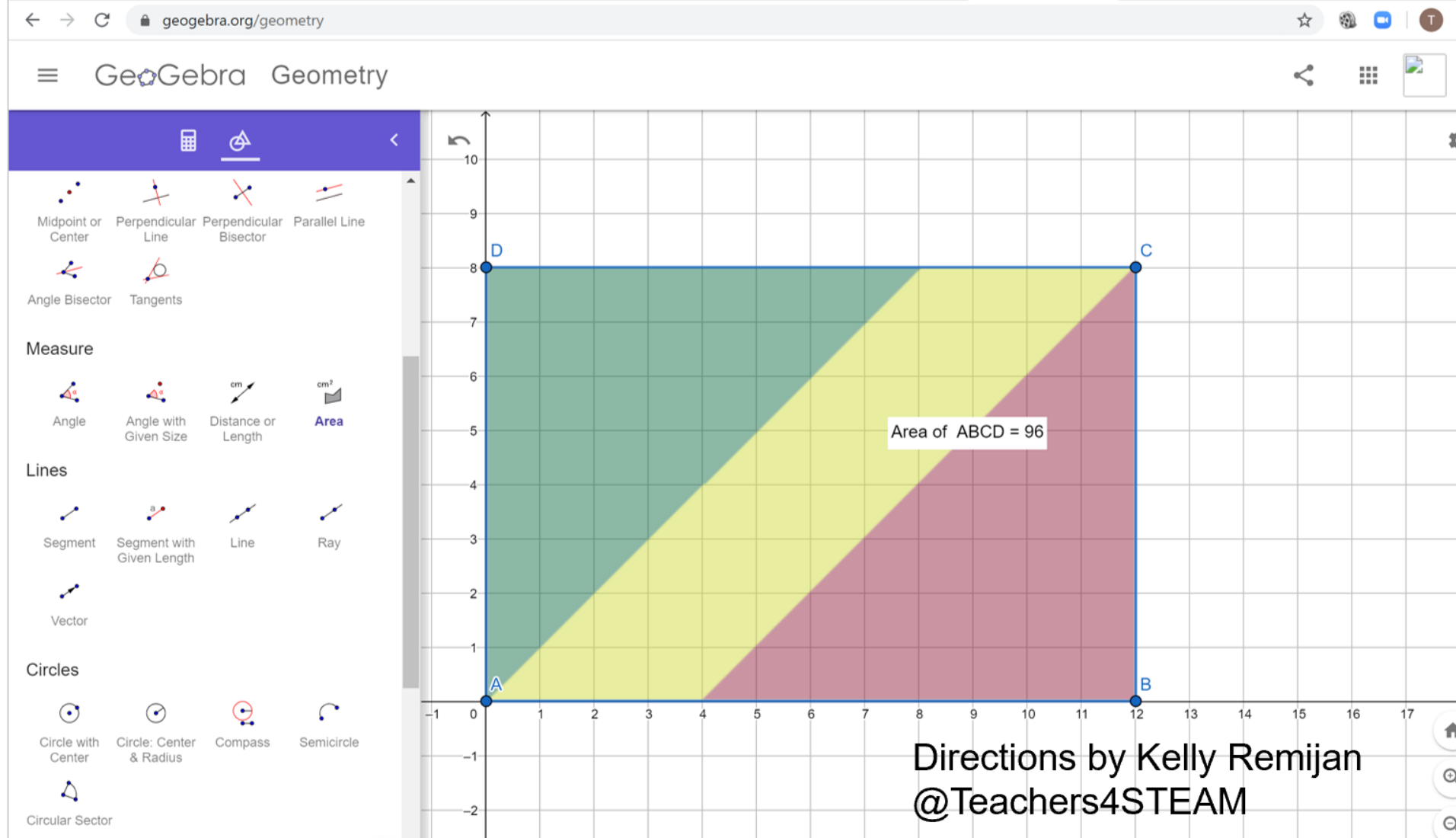


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You can try other polygons within the flag or another flag...



Now, let's change from working with AREA/Geometry to GRAPHING/Algebra

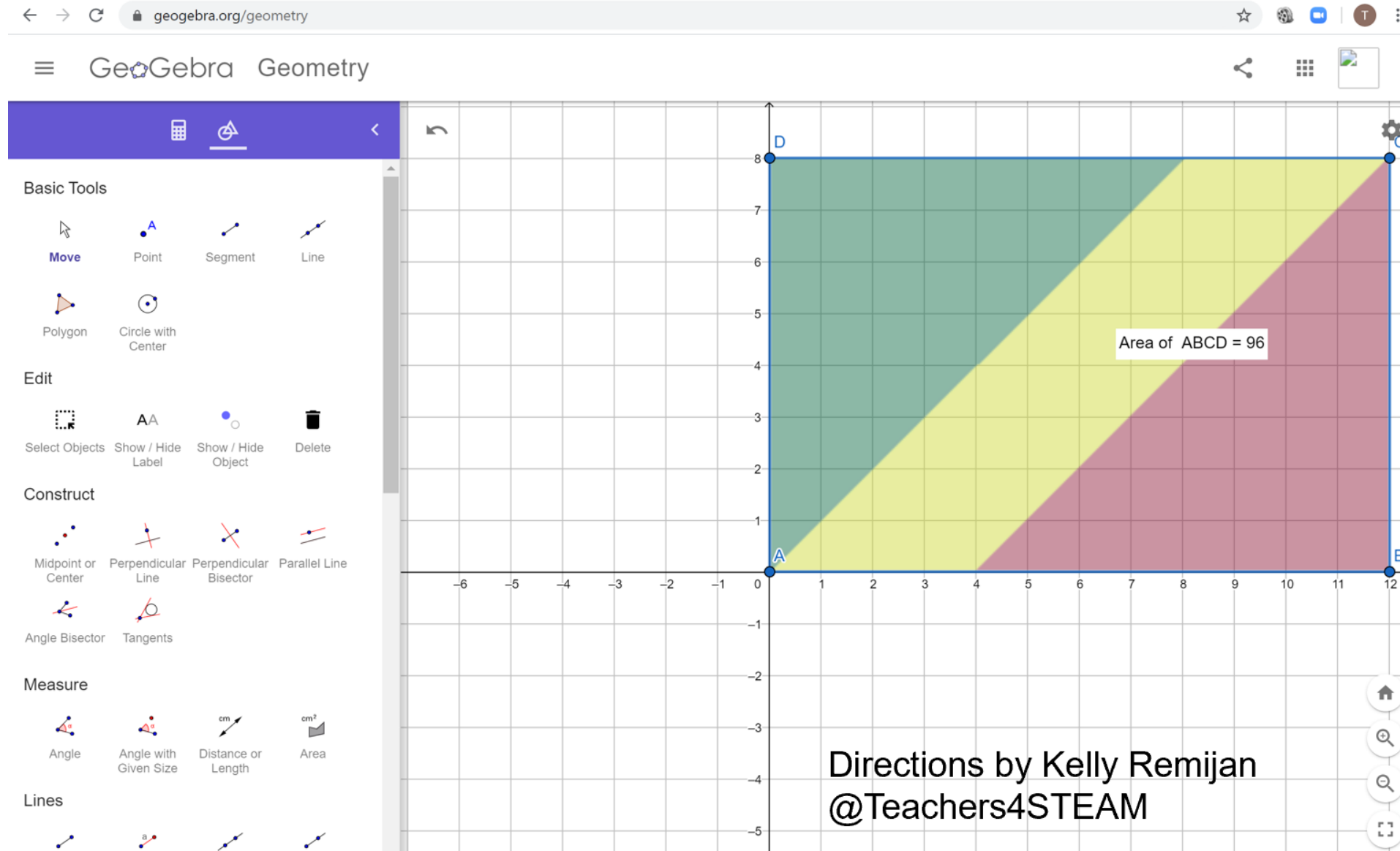


Under Basic Tools, Click “Move”

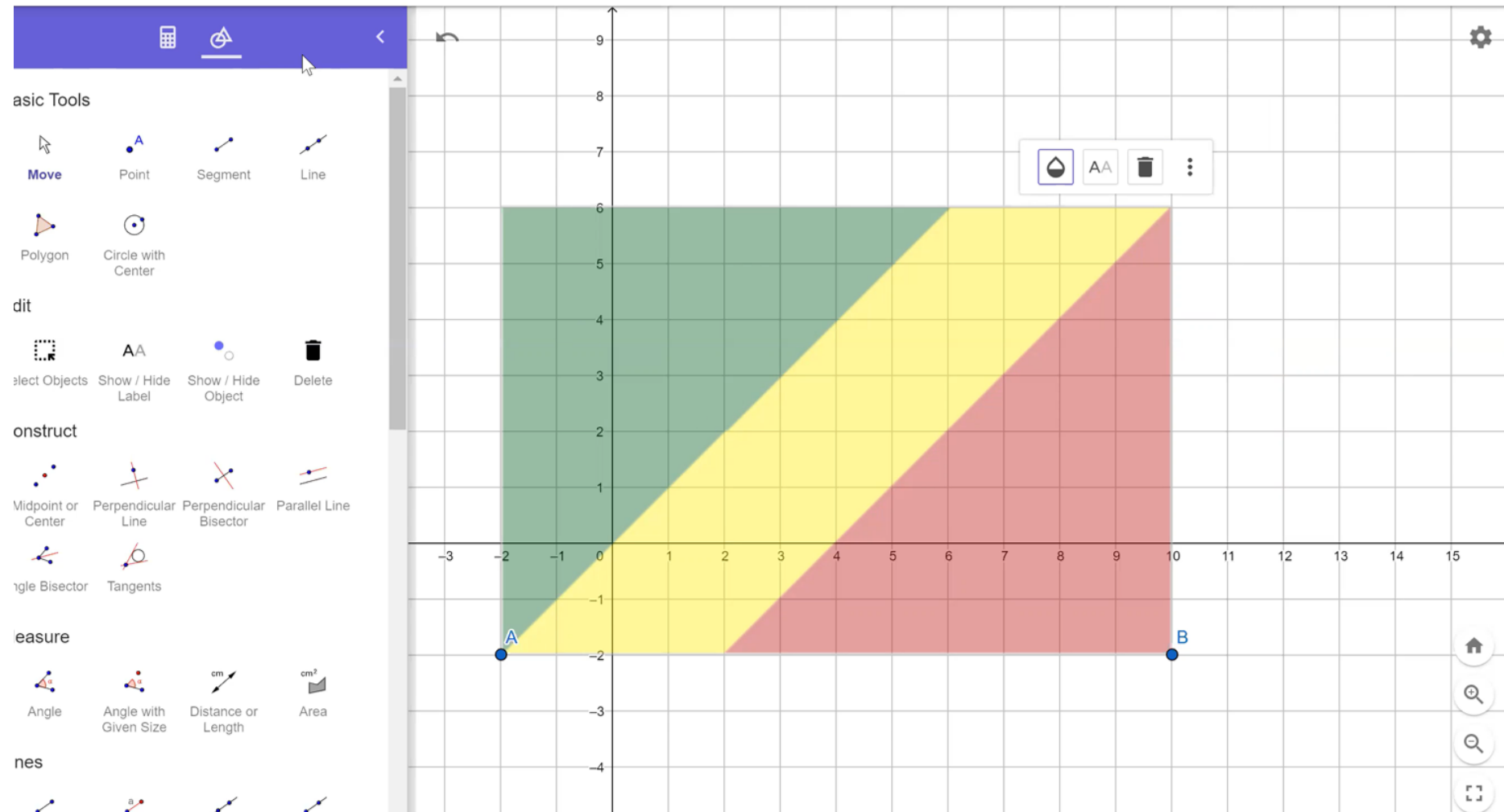
The screenshot shows the GeoGebra Geometry workspace. On the left, the 'Basic Tools' menu is open, and a yellow arrow points to the 'Move' tool. The workspace displays a rectangle ABCD on a coordinate grid. The rectangle is divided into three regions: a green triangle (ADC), a yellow triangle (ABC), and a pink triangle (ABD). A text box in the center of the rectangle states 'Area of ABCD = 96'. The coordinate grid ranges from -3 to 15 on the x-axis and -5 to 8 on the y-axis. The vertices are labeled A(0,0), B(12,0), C(12,8), and D(0,8).

Directions by Kelly Remijan
@Teachers4STEAM

Click point D (& delete), Click point C (& delete),
then click the flag

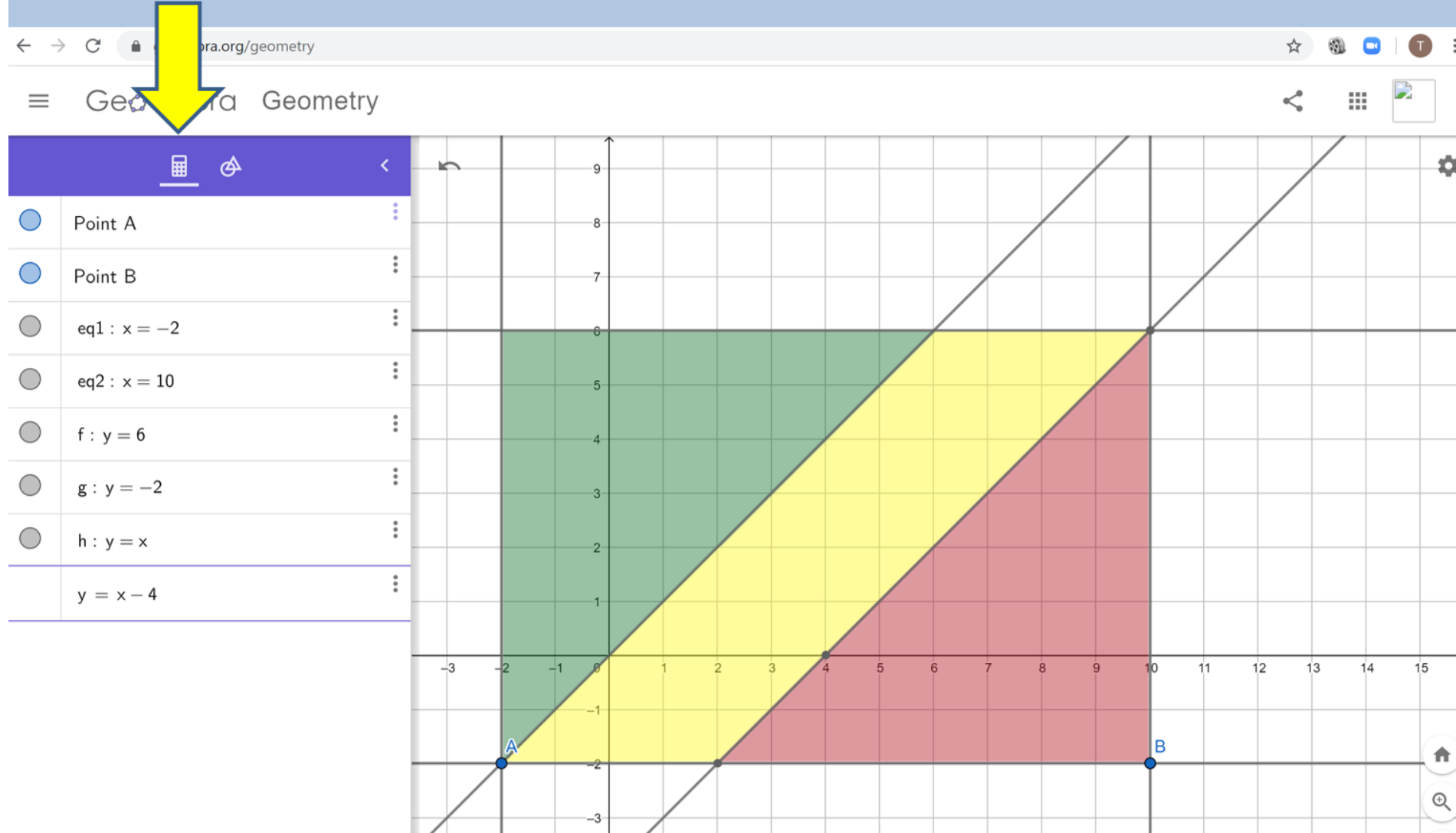


Click on the flag and drag to have a Domain of $[-2,10]$ and a Range of $[-2,6]$



Directions by Kelly Remijan
@Teachers4STEAM

Click on the calculator & type the equations that model the flag



QUESTIONS NOW?

Chat Box

IDEAS FOR LATER?

- 1. Have students work w/ other flags.**
- 2. Have students explore:**
 - * How can we rotate/reflect the flag?**
 - * How can we graph shaded regions?**

ON TUESDAY (4/7/20), the recording of this webinar will be posted online at:
<https://www.imsa.edu/events/>

Later, if needed, make a “Ask A Specialist” appointment:
<https://www.imsa.edu/educator-development/e-teaching-resources/>

Friday Night Fun with Flags: GeoGebra for Geometry and Graphing

Additional resources:

<https://www.geogebra.org/>

<https://www.britannica.com/topic/flag-of-the-Republic-of-the-Congo>

<https://www.britannica.com/topic/flag-of-Brazil>

<https://www.britannica.com/topic/flag-of-Switzerland>

<https://www.britannica.com/topic/flag-of-Germany>

Remijan, K.W. (Under Review). “Teaching Math with Flags: Geometry and Algebra Connections to Build Global Awareness”

Ask a Specialist

Get help from our Education experts!

The Illinois Mathematics and Science Academy (IMSA) Center for Teaching and Learning team is here to help teachers and parents with any questions from “how do I get my courses online quickly” to “how do I help with math problems”, to “where can I find resources for my student” to e-learning tools, and much more.

Schedule to reserve a live Zoom video appointment with any of our specialists: <https://www.imsa.edu/educator-development/e-teaching-resources/>



THANK YOU FOR TRYING GEOGEBRA!!

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PD & Curriculum Specialist
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Illinois Mathematics and Science Academy
Center for Teaching & Learning